IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Stephan Maucher, et al.

Serial No.:   10/562,669

Filed: December 28, 2005

For: COUNTER TRACK JOINT WITH OPTIMIZED BUILDING SPACE

Attorney Docket No.:   GKNG 1273 PCT

I hereby certify that this correspondence is being sent via facsimile to: Mail Stop PCT, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 fax number (571) 273-3201 on:

___April 19, 2006___   ___Angie Moscowitz___   _____
Date of Deposit   Signature

PRELIMINARY AMENDMENT

Mail Stop PCT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

For the Examiner's convenience, a clean copy of the specification and claims, as amended, is included with this paper.

Prior to examination, please amend the above-identified Application as follows:

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IN THE DRAWINGS:

Please substitute the eight (8) sheets of drawings submitted herewith containing Figures 1a and 1b; Figures 2a and 2b; Figures 3a, 3b and 3c; Figures 4a, 4b and 4c; Figure 5; Figure 6, Figure 7 and Figure 8 in place of the originally-filed drawing sheets containing the same Figures.

IN THE SPECIFICATION:

On page 8 of the English language translation of the specification, please amend the first heading of the specification to appear as follows:

~~Description~~ Technical Field

On page 8 of the English language translation of the specification, please add a new heading between the first and second full paragraphs of the specification to appear as follows:

Background

On page 8 and continuing on page 9 of the English Language translation of the specification, please amend the second full paragraph of the specification to appear as follows:

Counter track joints of the aforementioned type are basically known from ~~DE 102 20 711 A1~~ U.S. Publication No. 2004/0033837 A1, wherein joints with 6 balls and with 8 balls are shown. The type of ball tracks here corresponds to the type known from Rzeppa joints (RF joints) and undercut free-joints (UF joints). This means that the center lines of the ball tracks consist of uniform radii (RF joint) or consist of radii and adjacent axially parallel lines (UF joint). In the described counter track joints, the axial opening direction of the pairs of tracks alternates circumferentially, resulting in the type of counter track joint.

On page 9 of the English Language translation of the specification, please amend the second full paragraph of the specification to appear as follows:

Known inter alia from ~~DE 100 60 220 A1~~ U.S. Publication No. 2004/116192 A1 are counter track joints in which the center lines of the first ball tracks have a turning point near the joint opening, so that the center lines of the first outer ball tracks are S-shaped. Due to the symmetry condition, the same holds true for the center lines of the first inner ball tracks of the joint inner part. The articulation angle of these counter track joints can be increased in this way.

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On page 10 of the English language translation of the specification, please add a heading before the first full paragraph to appear as follows:

<u>Summary Of The Invention</u>

On page 10 of the English Language translation of the specification, please amend the first full paragraph of the specification to appear as follows:

~~The~~ <u>An</u> object of this invention is to create a counter track joint of the kind mentioned at the outset optimized to the building space, which occupies the least possible radial building space at a given torque capacity.

On page 10 of the English Language translation of the specification, please amend the second full paragraph of the specification to appear as follows:

A first solution ~~for this object is for~~ <u>provides that</u> the ratio $(V1)$ between the pitch circle diameter $(PCDS)$ of the shaft splines in the joint inner part to the third power and the product of ball diameter (DK) squared and pitch circle diameter of the balls with aligned joint $(PCDB)$ assumes a value of between 0.9 and 1.3, i.e.,

$$0.9 < V1 < 1.3 \text{ with } V1 = PCDS^3 / (DK^2 \cdot PCDB).$$

On page 10 of the English Language translation of the specification, please amend the third full paragraph of the specification to appear as follows:

In a second solution, the ratio $(V3)$ between the pitch circle diameter of the shaft splines in the joint inner part PCDS and the OR factor lies between 0.34 and 0.37, wherein the OR factor is defined as the sum of the pitch circle diameter of the balls $(PCDB)$ with aligned joint and the ball diameter (DK), so that

$$0.34 < V3 < 0.37 \text{ with } V3 = PCDS / (PCDB + DK).$$

On page 11 of the English Language translation of the specification, please amend the first full paragraph of the specification to appear as follows:

Each of the two approaches mentioned leads to the objective on its own. However, the result can be optimized by also using ~~all two~~ both approaches in combination to further pinpoint the results according to the invention.

On page 11 of the English Language translation of the specification, please amend the second full paragraph of the specification to appear as follows:

~~A preferred~~ One embodiment provides that the ratio (V2) between the IR factor and the OR factor measures between 0.525 and 0.585, wherein the IR factor is defined as the difference between the pitch circle diameter of the balls with aligned joint (PCDB) and the ball diameter (DK), and the OR factor is defined as the sum of the pitch circle diameter of the balls with aligned joint PCDB and the ball diameter DK, so that

$$0.525 < V2 < 0.585 \text{ with } V2 = (PCDB - DK) / (PCDB + DK).$$

On page 11 of the English Language translation of the specification, please amend the fourth full paragraph of the specification to appear as follows:

Another ~~preferred~~ embodiment further provides that the ratio (V4) between the pitch circle diameter of the shaft splines in the joint inner part (PCDS) and the IR factor measures between 0.58 and 0.65, wherein the IR factor is defined as the difference between the pitch circle diameter of the balls with aligned joint (PCDB) and the ball diameter (DK), so that

$$0.58 < V4 < 0.65 \text{ with } V4 = PCDS / (PCDB - DK).$$

On page 12 of the English Language translation of the specification, please amend the fourth full paragraph of the specification to appear as follows:

Joints according to the invention can also be used in longitudinal drive shafts of motor vehicles that comprise at least one fixed joint and a plunging joint or at least two fixed ~~hinges~~ joints and a plunging unit.

On page 12 of the English Language translation of the specification, please amend the fifth full paragraph of the specification to appear as follows:

Another ~~preferred~~ application involves multi-part longitudinal drive shafts in motor vehicles, which in addition to a fixed joint have at least one intermediate joint and a plunging joint and/or at least one intermediate joint and a longitudinal plunging unit.

On page 12 of the English language translation of the specification, please add a heading between the fifth and sixth full paragraphs to appear as follows:

<u>Brief Description Of The Drawings</u>

On page 13 of the English Language translation of the specification, please amend the first full paragraph of the specification to appear as follows:

Fig. 1 shows a counter track joint according to <u>an embodiment of</u> the invention with six balls, designed as a disc joint[[,]]<u>:</u>

    ~~a)~~ <u>A)</u> in an axial view<u>; and</u>

    ~~b)~~ <u>B)</u> in a longitudinal section along the [[A-A]] <u>B-B</u> line[[;]]<u>.</u>

On page 13 of the English Language translation of the specification, please amend the second full paragraph of the specification to appear as follows:

Fig. 2 shows a counter track joint according to <u>an embodiment of</u> the invention with eight balls, designed as a disc joint[[,]]<u>:</u>

    ~~a)~~ <u>A)</u> in an axial view<u>; and</u>

    ~~b)~~ <u>B)</u> in a longitudinal section along the [[A-A]] <u>B-B</u> line[[;]]<u>.</u>

On page 13 of the English Language translation of the specification, please amend the third full paragraph of the specification to appear as follows:

Fig. 3 shows a counter track joint according to <u>an embodiment of</u> the invention with six balls, designed as a monoblock joint[[,]]:

a) <u>A)</u> in an axial view;

b) <u>B)</u> in a longitudinal section along the [[A-A]] <u>B-B</u> line; and

c) <u>C)</u> in a longitudinal section along the [[B-B]] <u>C-C</u> line[[;]].

On page 13 of the English Language translation of the specification, please amend the fourth full paragraph of the specification to appear as follows:

Fig. 4 shows a counter track joint according to <u>an embodiment of</u> the invention with eight balls, designed as a monoblock joint[[,]]:

a) <u>A)</u> in an axial view;

b) <u>B)</u> in a longitudinal section along the [[A-A]] <u>B-B</u> line; and

c) <u>C)</u> in a longitudinal section along the [[B-B]] <u>C-C</u> line[[;]].

On page 13 of the English Language translation of the specification, please amend the fifth full paragraph of the specification to appear as follows:

Fig. 5 shows a drive shaft according to <u>an embodiment of</u> the invention with at least one joint according to the invention and a plunging unit in partial longitudinal section[[;]].

On page 13 of the English Language translation of the specification, please amend the sixth full paragraph of the specification to appear as follows:

Fig. 6 shows an installation scenario according to <u>an embodiment of</u> the invention for a drive shaft according to Fig. 5 in a motor vehicle in partial longitudinal section[[;]].

On page 13 of the English Language translation of the specification, please amend the seventh full paragraph of the specification to appear as follows:

Fig. 7 shows a longitudinal drive shaft according to <u>an embodiment of</u> the invention with a fixed joint according to the invention and a plunging joint in longitudinal half section[[;]].

On page 13 and continuing on page 14 of the English Language translation of the specification, please amend the seventh full paragraph of the specification to appear as follows:

Fig. 8 shows a longitudinal drive shaft according to <u>an embodiment of</u> the invention with a fixed joint according to the invention as an intermediate joint, another universal joint as an intermediate joint, and a plunging joint in longitudinal half section.

On page 14 of the English language translation of the specification, please add a heading before the first full paragraph to appear as follows:

<u>Detailed Description</u>

On page 15 of the English Language translation of the specification, please amend the first full paragraph of the specification to appear as follows:

The two depictions on Fig. 2 will be described together below. The universal joint ~~11~~ 11_2 according to the invention is designed as a so-called disc joint. It encompasses a joint outer part ~~12~~ 12_2 with a first opening 13 and a second opening 14. The joint further encompasses a joint inner part ~~15~~ 15_2, a ball cage ~~16~~ 16_2 and torque-conveying balls 17. First outer ball tracks 18 in the joint outer part ~~12~~ 12_2 and first inner ball tracks 19 in the joint inner part ~~15~~ 15_2 accommodate balls 17_1 and form first pairs of tracks with each other. Second outer ball tracks 20 in the joint outer part ~~12~~ 12_2 and second inner ball tracks 21 in the joint inner part ~~15~~ 15_2 form second pairs of tracks with each other, which accommodate second balls 17_2. The two types of pairs of tracks (18, 19; 20, 21) are alternately arranged over the circumference. Eight pairs of tracks are especially provided. The first pairs of tracks form an opening angle with each other that points in a first direction R_1 to the opening 13. The second pairs of tracks form an opening angle with each other that points in a second direction R_2 toward the opening 14. A center joint plane E that accommodates the centers P of the balls intersects the longitudinal axis of the joint defined by the longitudinal axes A_{12} of the joint outer part and A_{15} of the joint inner part in a joint center M. The ball cage ~~16~~ 16_2 holds the first balls 17_1 and

second balls 17_2 in alternating circumferentially distributed cage windows 24_1, 24_2. The pitch circle diameter on which the ball centers P lie with the aligned joint is denoted with PCDB. The pitch circle diameter of the insertion opening 27 of the joint inner part ~~15~~ 15_2, which generally has shaft splines not shown here in detail, is denoted with PCDS. The ball diameter is marked DK. Since two first pairs of tracks (18, 19) are cut in plane A-A, the sectionally depicted pairs of tracks both open in the first direction R_1 toward the opening 13.

On page 16 of the English Language translation of the specification, please amend the first full paragraph of the specification to appear as follows:

The individual depictions on Fig. 3 will be described together below. The same details as on Fig. 1 are labeled with the same reference numbers, and modified features are indexed by 100. Reference is made to the corresponding description. Instead of a second opening 14, the joint outer part ~~12~~ 112 here has a formed-on bottom 25 followed by a shaft journal 26. The joint otherwise largely corresponds with the one shown on Fig. 1. A first (upper) and second (lower) pair of tracks is cut in a radially opposing manner in plane AA, while a second (upper) and a first (lower) pair of tracks is cut in a radially opposing manner in plane BB.

On page 16 of the English Language translation of the specification, please amend the second full paragraph of the specification to appear as follows:

The individual depictions on Fig. 4 will be described together below. Fig. 4 is a monoblock joint like Fig. 3, but includes eights balls like the joint of Fig. 2. The same details as on Fig. 2 and Fig. 3 are labeled with the same reference numbers, and modified features are further indexed by 100. Reference is made to the corresponding description. Instead of a second opening 14 (Fig. 2), the joint outer part ~~12~~ 212 here has a formed-on bottom 25 followed by a shaft journal 26. The joint otherwise largely corresponds to the one shown ~~on~~ in Fig. 2. Two second pairs of tracks ~~(20, 21)~~ 120, 121 are cut in the plane AA in a respectively radially opposing manner, while two first pairs of tracks ~~(18, 19)~~ 118, 119 are cut in a radially opposing manner in plane BB.

On page 16 of the English Language translation of the specification, please amend the third full paragraph of the specification to appear as follows:

Fig. 5 shows a drive shaft that has a universal joint according to the invention as a monoblock joint based on one of Fig. 3 or 4, along with an intermediate shaft 35 and a second universal joint 31, which can also be a joint according to the invention, especially structurally identical with the joint ~~11~~ 111, 211. The intermediate shaft 35 encompasses an axial plunging unit 28, which ~~consists of~~ includes a sleeve 29, a journal 30 as well as torque-conveying balls active between the two and not denoted in specific detail as the essential components, and permits a longitudinal compensation of the drive shaft between the universal joints ~~11, 31~~ 111, 211 and 31.

On page 16 and continuing on page 17 of the English Language translation of the specification, please amend the fourth full paragraph of the specification to appear as follows:

Fig. 6 shows a drive shaft according to Fig. 5 installed as a side shaft in a motor vehicle. The shaft journal of the joint ~~11~~ 111, 211 according to the invention is inserted into a differential gear 32 and secured therein, while the shaft journal of the second fixed joint 31 is inserted into a wheel hub arrangement 33 with a wheel mount 34. The same details are marked with the same reference numbers as on Fig. 5.

On page 17 of the English Language translation of the specification, please amend the first full paragraph of the specification to appear as follows:

Fig. 7 shows a drive shaft according to the invention with a joint ~~11~~ 11, 11_2 according to the invention designed as a disc joint according to one of Fig. 1 or 2, which takes the form of a longitudinal drive shaft. An intermediate shaft 41 comprises a shaft tube 39 and two shaft journals 36, 37 welded thereto. The shaft journal 37 is connected with a plunging joint 38, in particular a so-called VL-joint. The shaft journal 36 is connected with the joint ~~11~~ 11, 11_2 according to the invention.

On page 17 of the English Language translation of the specification, please amend the second full paragraph of the specification to appear as follows:

Fig. 8 shows a cardan shaft according to the invention with a joint ~~11~~ 11, 11$_2$ according to the invention designed as a disc joint according to one of Fig. 1 or 2, which takes the form of a longitudinal drive shaft, and has a disc joint 42, an intermediate shaft 43 with a flange 44 and a journal 45 from right to left, along with an elastic intermediate bearing 46, wherein the joint ~~11~~ 11, 11$_2$ is followed by another intermediate shaft 47 with a shaft journal 48, another intermediate bearing 49 and a universal joint 50; finally, there is another intermediate shaft 51 with shaft journals 52 connected with a universal plunging joint 53, in particular a VL-joint. Shafts of this kind are incorporated in the longitudinal drive train of motor vehicles between a gearbox output and a differential input.

On page 17 of the English Language translation of the specification, please add the following five new paragraphs after the last paragraph of the specification to appear as follows:

In each embodiment of the joints 11, 11$_2$, 111, 211, the ratio (V1) between the pitch circle diameter (PCDS) of the shaft splines in the joint inner part to the third power and the product of ball diameter (DK) squared and pitch circle diameter of the balls with aligned joint (PCDB) assumes a value of between 0.9 and 1.3, i.e.,

$$0.9 < V1 < 1.3 \text{ with } V1 = PCDS^3 / (DK^2 \cdot PCDB).$$

Alternatively or, in addition, the ratio (V3) between the pitch circle diameter of the shaft splines in the joint inner part (PCDS) and the OR factor lies between 0.34 and 0.37, wherein the OR factor is defined as the sum of the pitch circle diameter of the balls (PCDB) with aligned joint and the ball diameter (DK), so that

$$0.34 < V3 < 0.37 \text{ with } V3 = PCDS / (PCDB + DK).$$

In combination with at least one of V1 or V3 being satisfied, the ratio (V2) between the IR factor and the OR factor measures between 0.525 and 0.585, wherein the IR factor is defined as the difference between the pitch circle diameter of the balls with aligned joint (PCDB) and the ball diameter (DK), and the OR factor is defined as the sum of the pitch circle diameter of the balls with aligned joint (PCDB) and the ball diameter (DK), so that

$$0.525 < V2 < 0.585 \text{ with } V2 = (PCDB - DK) / (PCDB + DK).$$

Further in combination with at least one of V1 or V3 being satisfied, the ratio (V4) between the pitch circle diameter of the shaft splines in the joint inner part (PCDS) and the IR factor measures between 0.58 and 0.65, wherein the IR factor is defined as the difference between the pitch circle diameter of the balls with aligned joint (PCDB) and the ball diameter (DK), so that

$$0.58 < V4 < 0.65 \text{ with } V4 = PCDS / (PCDB - DK).$$

For each embodiment, the joint can be configured wherein the articulation angle ranges from 25° to 45°, in particular from 30° to 40°.